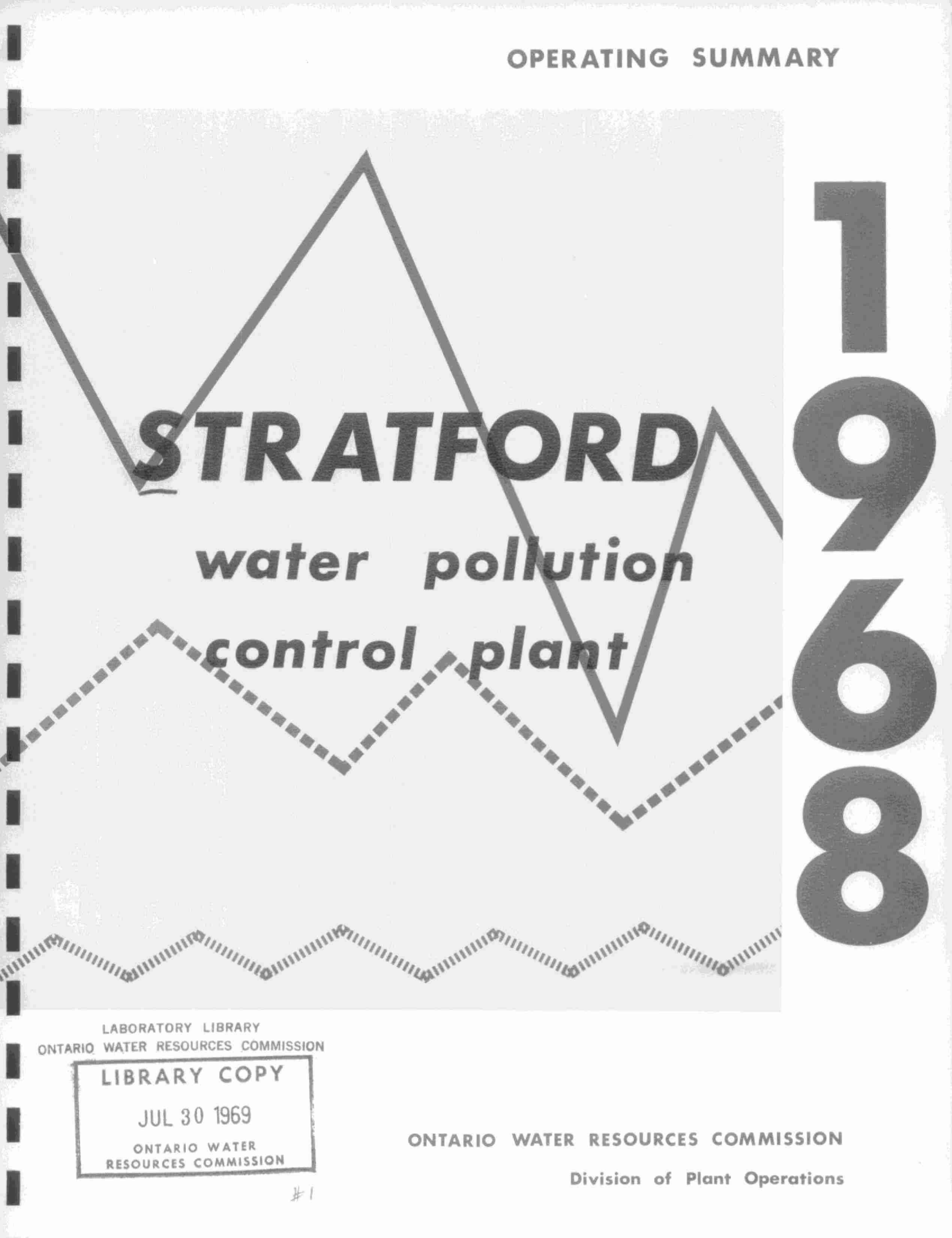




STRATFORD

water pollution

control plant

1968

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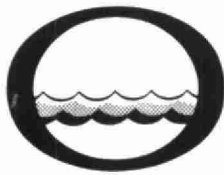
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Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 7
Ontario

We are pleased to present you with the Operating Summary for the water pollution control facilities operated for you during 1968.

Both the financial and technical information presented should be of assistance to your present and future planning in this important phase of municipal activity.

A new format has been devised to allow greater readability with equally detailed content. We trust that this will meet with your approval.

Our staff wish to express their appreciation for your co-operation throughout the year.


D. S. Caverly,
General Manager.


D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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STRATFORD
water pollution control plant

operated for

THE CITY OF STRATFORD

by the

ONTARIO WATER RESOURCES COMMISSION

1968 ANNUAL OPERATING SUMMARY

FOREWORD

● This operating summary outlines the project's technical capabilities and financial status in 1968. Such information mirrors past and present performance, but a major intention is to anticipate the future -- to solve problems before they occur.

The new format in which this year's data are presented is designed to offer a higher level of readability than in the past, without a corresponding decrease in compactness, accuracy and detail.

Although your Regional Operations Engineer carries the major responsibility for the contents of the report, those involved in its preparation are attached to several Commission sections and divisions. The statistics section of the Division of Plant Operations compiled the information for the graphs and charts. The draughting section of the Division of Sanitary Engineering drew the graphs. The Division of Finance provided all cost data.

Only the close co-operation of these departments allowed the publication of this summary.

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'68 REVIEW

The total operating costs for the year were \$69,371.20, an increase of \$3,777.55 over 1967. The unit cost of treating one million gallons increased from \$41.34 in 1967 to \$56.30 in 1968.

In 1968 the plant treated an average flow of 3.40 mgd which is 85% of the design flow of 4.0 mgd. The design flow was exceeded 38% of the time during the year.

Reductions of 95% of BOD and 95% of suspended solids were experienced in 1968 as compared to 93.5% of BOD and 94.9% of suspended solids in 1967.

The average raw sewage strength was 282 mg/l for BOD and 232 mg/l for suspended solids. Raw sewage strength in 1967 were 204 mg/l for BOD and 252 mg/l for suspended solids.

The average final effluent BOD and suspended solids concentrations were respectively 8.0 mg/l and 12.0 mg/l. Chlorination of the plant effluent commenced in September immediately after the completion of the chlorination facilities.

PROJECT COSTS

NET CAPITAL COST (Final)	\$925,309.42
DEDUCT - Payments from Municipalities	<u>309.42</u>
Long Term Debt to OWRC	<u>\$925,000.00</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1968	<u>\$246,909.35</u>
Net Operating	\$ 69,371.20
Debt Retirement	18,667.00
Reserve	4,346.01
Interest Charged	<u>51,932.67</u>
TOTAL	<u>\$144,316.88</u>

RESERVE ACCOUNT

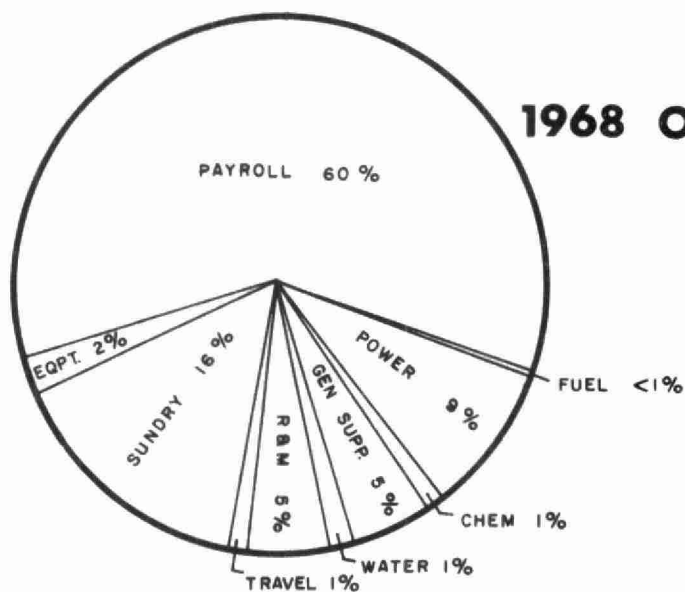
Balance at January 1, 1968	\$ 68,830.77
Deposited by Municipality	4,346.01
Interest Earned	4,164.47
	<u>77,341.25</u>
Less Expenditures	<u>684.00</u>
Balance at December 31, 1968	<u>\$ 76,657.25</u>

Monthly Operating Costs

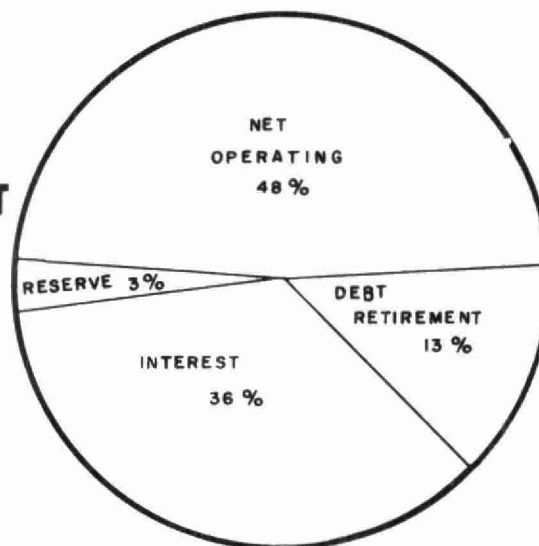
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAY ROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY	WATER	TRAVEL
JAN	3200.02	2763.93	-	-	-	-	194.68	-	104.56	22.34	-	114.51
FEB	4966.22	2749.84	-	-	563.48	-	136.10	-	425.41	1027.21	53.40	10.78
MAR	6517.08	4476.18	-	-	649.08	-	121.34	-	149.69	1056.75	53.40	10.64
APRIL	4432.05	2780.58	-	-	515.48	-	458.19	23.54	129.80	458.88	53.40	12.18
MAY	5578.48	2771.99	201.49	-	569.88	-	587.42	251.84	290.74	841.50	53.40	10.22
JUNE	4740.45	2749.82	266.27	-	530.68	-	261.33	73.61	18.70	775.30	53.40	11.34
JULY	5739.13	2721.98	287.22	-	568.68	-	189.30	48.31	824.89	938.83	53.40	106.52
AUG	7366.86	4152.39	821.80	118.50	553.08	-	165.91	58.87	221.49	1134.68	58.52	11.62
SEPT	4449.45	2975.99	(23.62)	-	537.88	-	293.69	16.59	40.69	532.31	53.40	22.52
OCT	4604.32	2830.31	-	-	533.08	99.04	341.21	-	39.90	658.99	87.44	14.35
NOV	6657.32	2844.93	-	64.05	687.08	-	287.97	248.94	85.80	2276.63	98.72	63.20
DEC	11119.82	6484.65	-	-	715.08	252.00	394.07	746.31	956.66	1435.10	53.40	82.55
TOTAL	69371.20	40302.59	1553.16	252.55	6423.48	351.04	3431.21	1468.01	3288.33	11158.52	671.88	470.43

*SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE \$9,768.85
 BRACKETS INDICATE CREDIT

1968 OPERATING COSTS



TOTAL ANNUAL COST



Yearly Operating Costs

YEAR	M.G.TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1964	994.3	\$53,619.88	\$53.95	3 cents
1965	1142.5	57,079.98	49.96	3 cents
1966	1120.8	59,148.93	52.7	2 cents
1967	1586.6	65,593.65	41.34	2 cents
1968	1232.1	69,371.20	56.30	2 cents

Process Data

The average daily flows decreased from 4.35 mg in 1967 to 3.40 mg in 1968. Daily flows as low as 1.4 mg and as high as 15.91 mg were experienced throughout the year.

The design BOD concentration of 140 mg/l and suspended solids concentration of 250 mg/l were exceeded respectively 75% and 58% of the time during the year. In spite of the organic overload, the OWRC objectives for the final effluent were exceeded only 8% of the time for BOD and 27% of the time for suspended solids.

PLANT FLOWS and CHLORINATION

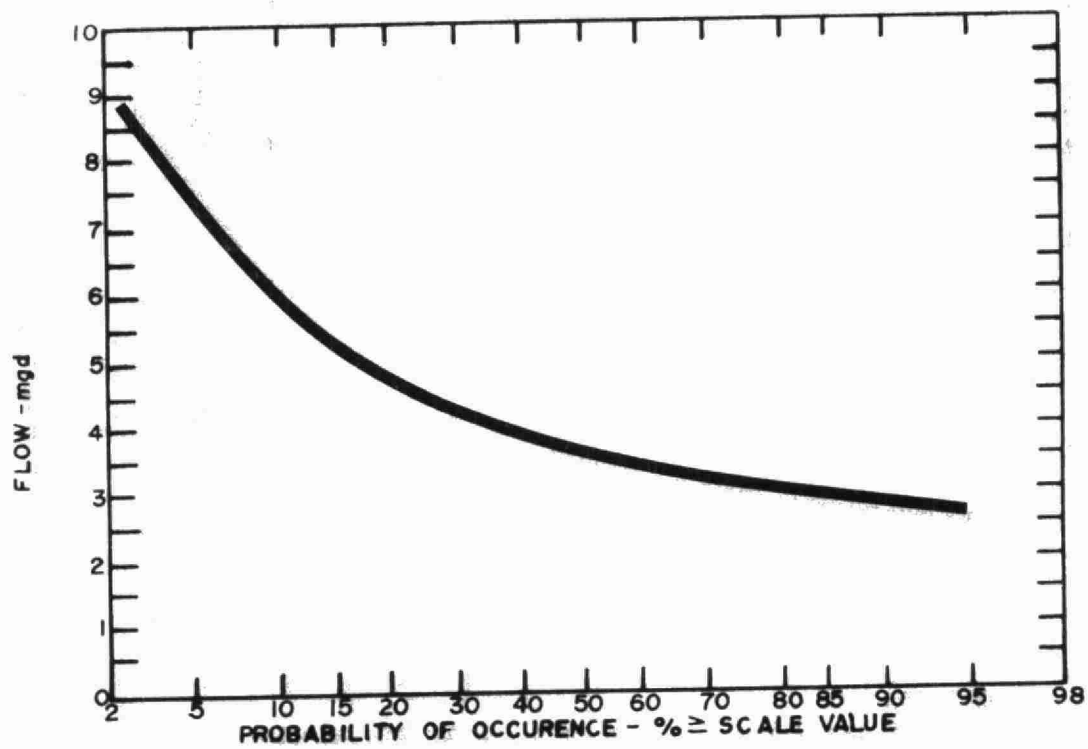
MONTH	TOTAL FLOW mg	AVERAGE DAILY FLOW mg	MAXIMUM DAILY FLOW mg	MINIMUM DAILY FLOW mg	CHLORINE USED 10 ³ lbs.	DOSAGE mg/l
JAN	100.5	3.24	10.99	2.12	0	-
FEB	126.8	4.37	15.91	1.50	0	-
MAR	141.7	4.57	7.70	2.21	0	-
APR	96.5	3.22	6.34	2.21	0	-
MAY	86.7	2.79	3.85	2.16	0	-
JUN	85.3	2.84	7.22	2.03	0	-
JUL	84.9	2.74	4.59	1.41	0	-
AUG	85.0	2.74	8.58	1.64	0	-
SEPT	98.4	3.28	9.99	1.93	* .91	1.5
OCT	106.8	3.44	9.43	2.11	1.50	1.4
NOV	109.2	3.64	13.55	1.85	** 1.46	1.4
DEC	110.3	3.55	8.08	1.98	1.72	1.6
TOTAL	1232.1	-	-	-	5.59	-
AVERAGE	-	3.40	-	-	-	1.5

* Chlorination for 18 days

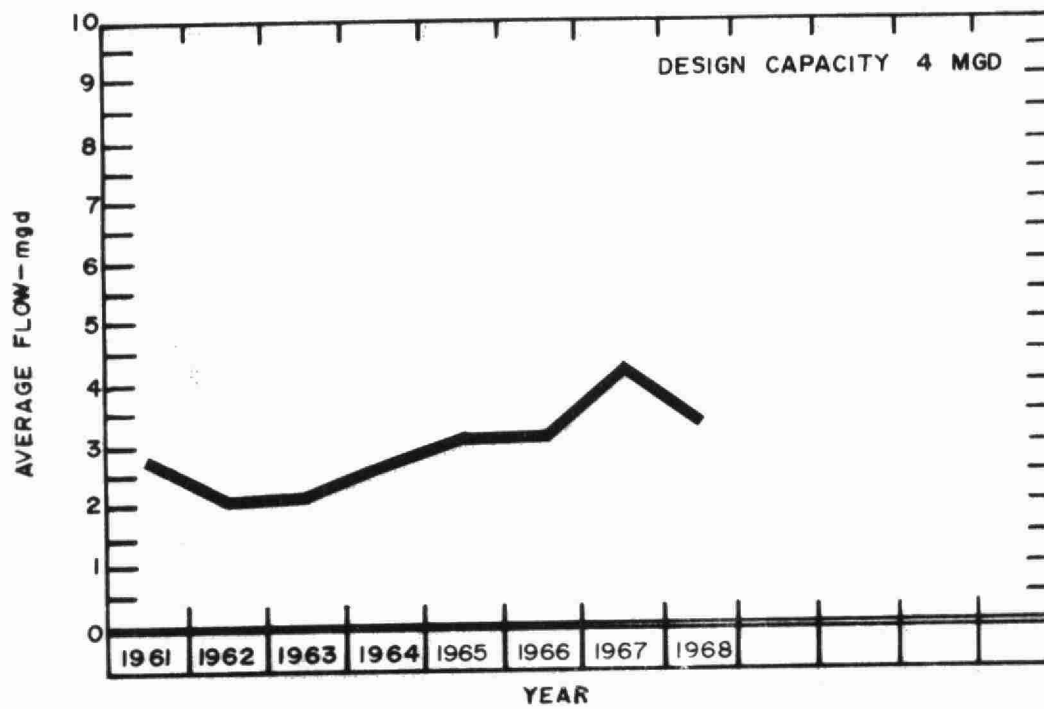
** Chlorination for 28 days

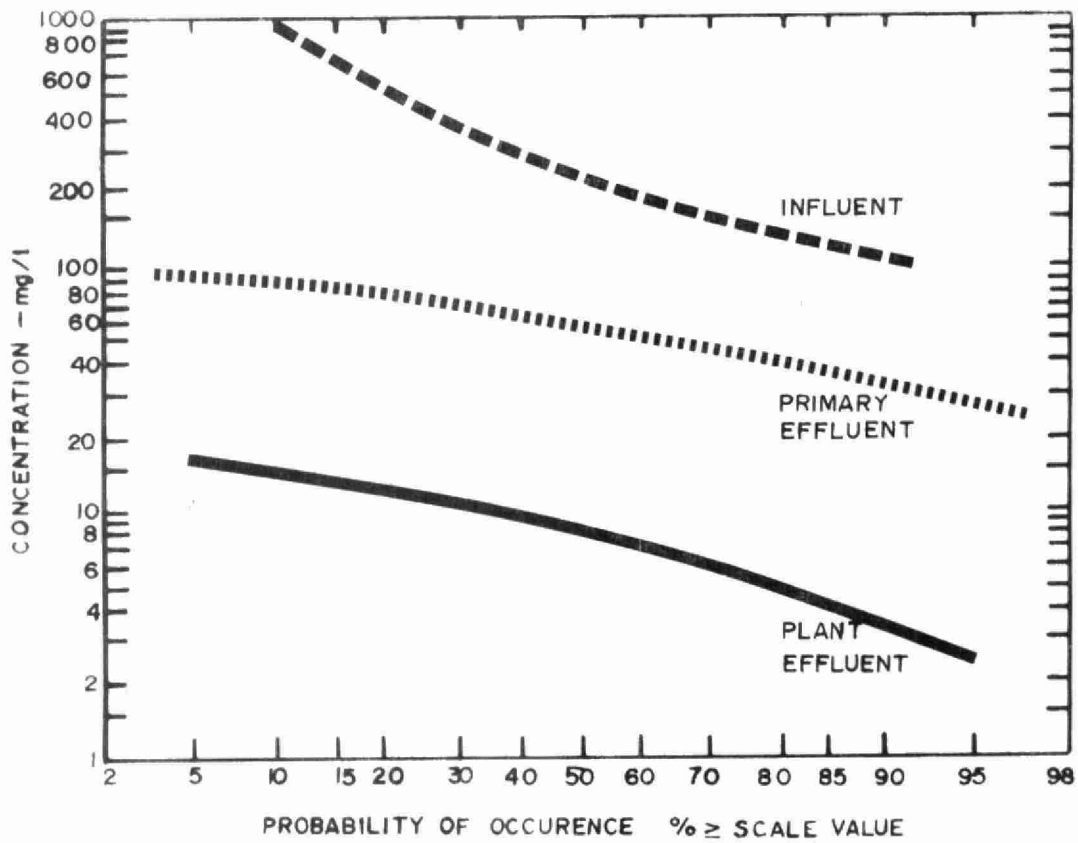
COMMENTS

As soon as the appropriate facilities were installed in September, chlorination of the final effluent began. Based on four months' data, the average dosage rate required to produce a chlorine residual of 0.5 mg/l after 15 minutes' contact was 1.5 mg/l.

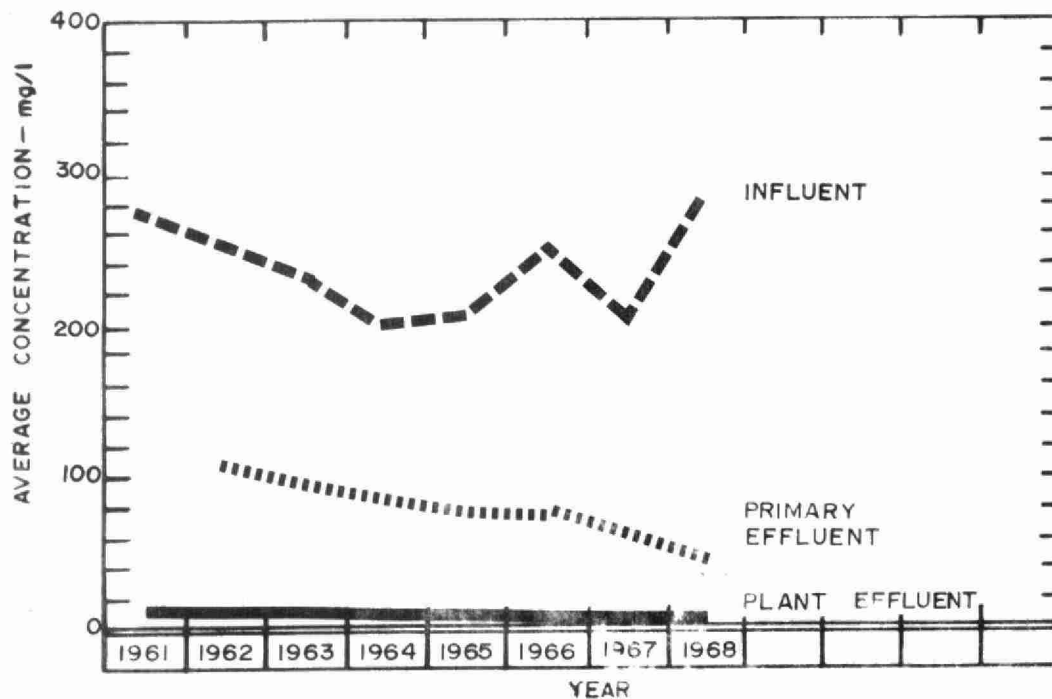


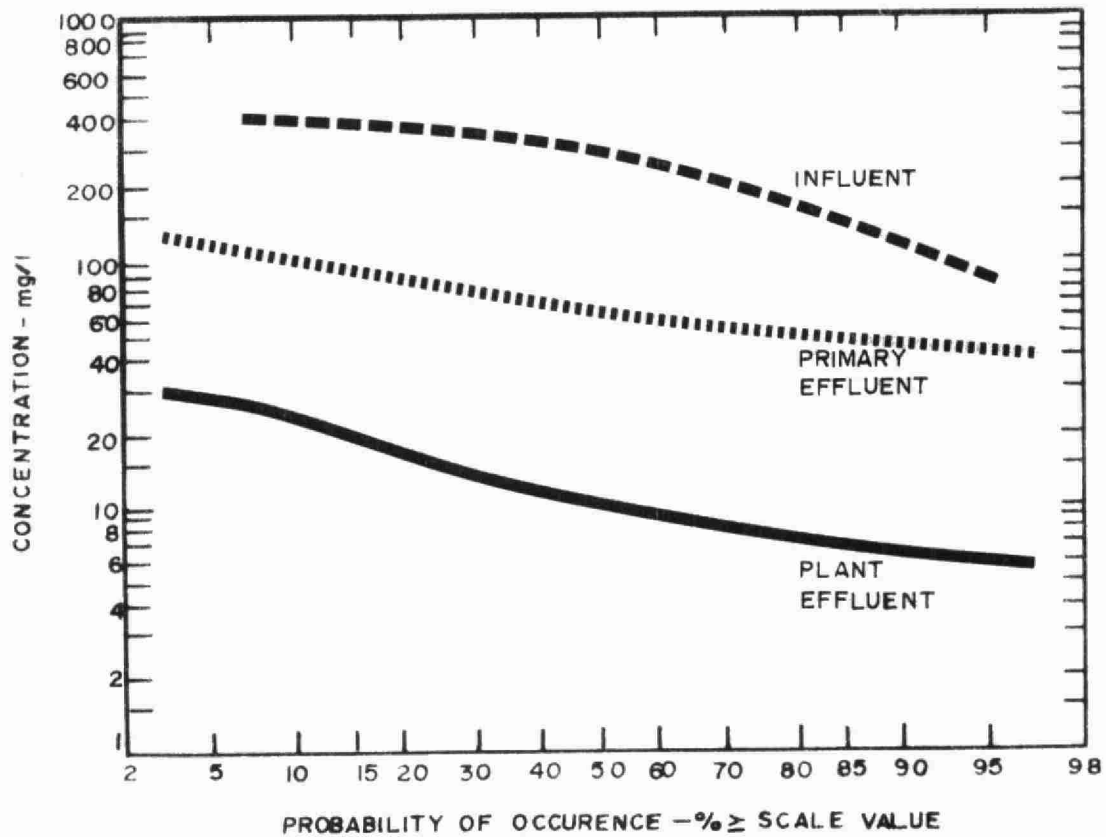
F L O W S



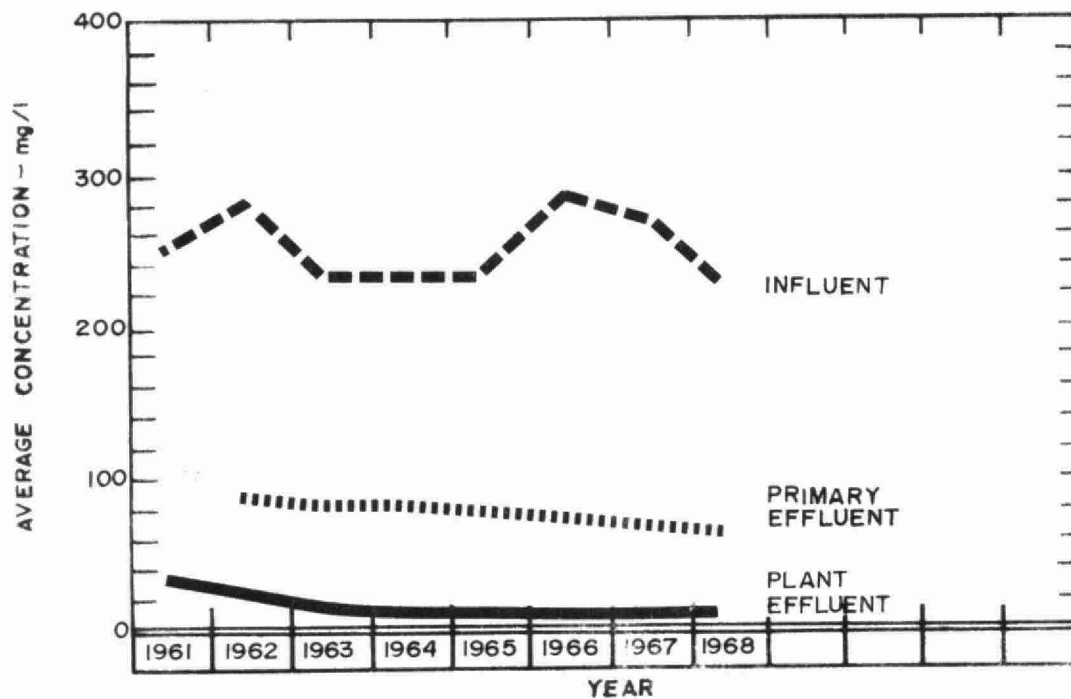


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS



PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT
	INF CONC ^N mg/l	EFF CONC ^N mg/l	RED ^N %	REMOVAL 10 ⁵ lb	INF CONC ^N mg/l	EFF CONC ^N mg/l	RED ^N %	REMOVAL 10 ⁵ lb	REMOVAL ft ³
JAN	92	5	94	.87	130	17	87	1.14	38
FEB	-	5	-	-	-	8	-	-	125
MAR	86	8	91	1.10	107	11	90	1.36	22
APR	306	7	98	2.88	286	21	93	2.56	15
MAY	340	11	97	2.85	322	15	95	2.66	16
JUN	435	6	99	3.66	470	8	98	3.94	53
JULY	165	14	92	1.28	218	8	96	1.78	35
AUG	-	16	-	-	-	9	-	-	16
SEPT	125	9	93	1.15	157	7	96	1.48	174
OCT	193	5	97	2.01	190	10	95	1.92	72
NOV	995	7	99	10.79	287	16	94	2.96	89
DEC	86	5	94	0.89	150	8	95	0.16	23
TOTAL	-	-	-	-	-	-	-	-	678
AVERAGE	282	8	97	2.75	232	12	95	2.00	57

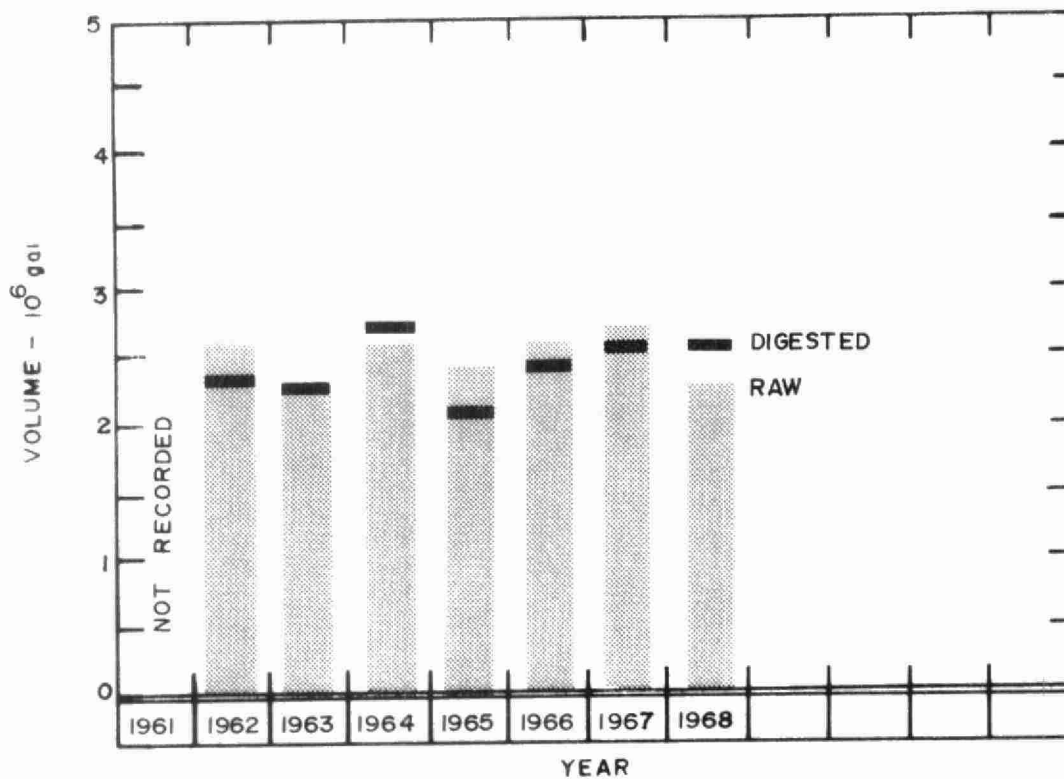
AERATION

MONTH	AVERAGE FLOW mgd	PRIMARY EFF		SECONDARY EFF		MLSS CONC ^N mg/l	F/M $\left(\frac{\text{lb BOD}}{\text{lb MLSS}}\right)$	AIR USED $\left(\frac{1000 \text{ ft}^3}{\text{lb BOD}}\right)$ REMOVED	WASTE SLUDGE 10^3 lb
		BOD CONC ^N mg/l	SS CONC ^N mg/l	BOD CONC ^N mg/l	SS CONC ^N mg/l				
JAN	3.24	44	60	5	17	2,410	.06	2.91	27.8
FEB	4.37	52	59	5	8	2,210	.11	1.54	15.4
MAR	4.57	42	43	8	11	2,250	.11	1.91	38.9
APRIL	3.22	47	52	7	21	2,400	.21	2.27	37.9
MAY	2.79	76	94	11	15	2,300	.10	1.83	34.2
JUN	2.84	44	72	6	8	2,550	.05	2.86	48.2
JUL	2.74	54	71	14	8	2,550	.06	5.97	40.2
AUG	2.74	-	-	16	9	2,630	-	-	39.1
SEPT	3.28	66	77	9	7	2,530	.09	1.78	36.9
OCT	3.44	36	56	4	6	2,460	.05	3.36	48.7
NOV	3.64	61	67	7	16	2,500	.10	1.94	37.8
DEC	3.55	43	50	5	8	2,520	.07	2.80	51.0
TOTAL	-	-	-	-	-	-	-	-	456.1
AVERAGE	3.40	51	64	8	11	2,450	.09	2.65	38.0

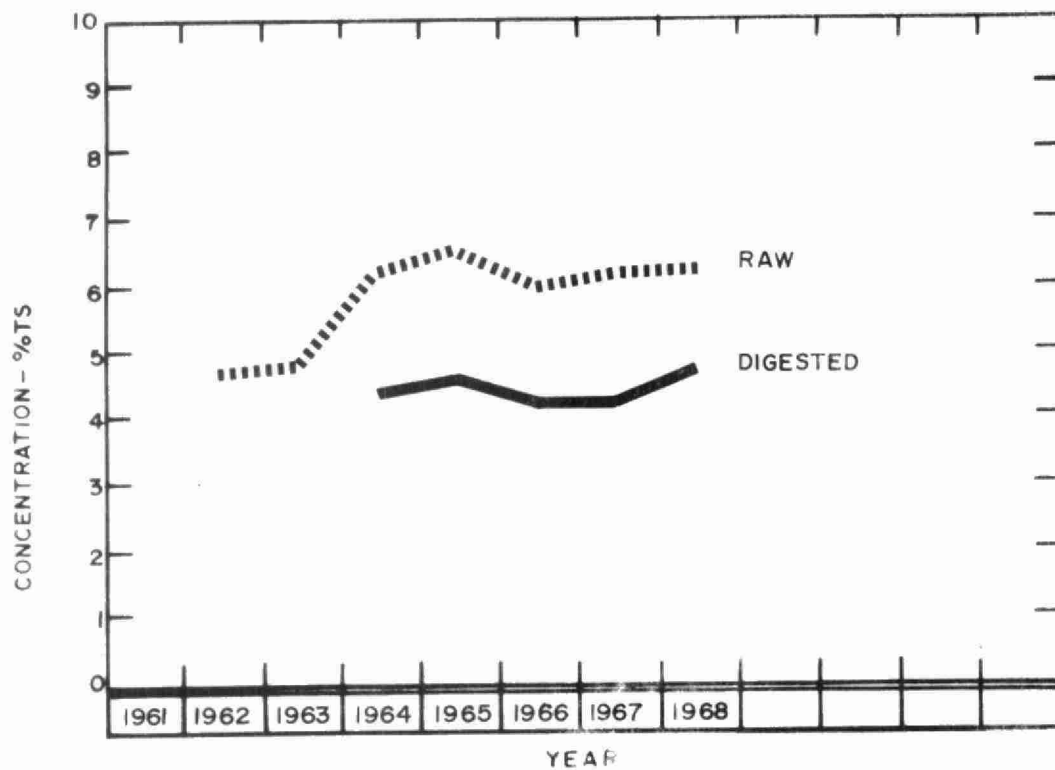
COMMENTS

The loading to the aeration section averaged 0.09 lbs. of BOD per pound of MLSS. Design loading criteria vary from 0.25 to 0.50 lbs. of BOD per lb. of MLSS and the mixed liquor generally requires from 500 to 700 cu. ft. of air per lb. of BOD removed.

Because of the low loadings to the aeration section, considerable nitrification takes place resulting in tremendous air requirements per lb. of BOD removed. An average of 2,650 cu. ft. of air was required to remove one pound of BOD at the Stratford plant.



DIGESTION



SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10 ⁵ gal	T. S. %	V. S. %	VOLUME 10 ⁵ gal	T. S. %	V. S. %	VOLUME 10 ⁵ gal	T. S. %	LIQUID yd ³	DEWATERED yd ³
JAN	1.94	5.6	70	2.66	4.5	56	0	-	1456	0
FEB	1.96	8.0	70	2.44	4.6	59	0	-	1435	0
MAR	1.70	6.4	74	1.14	4.9	61	0	-	672	0
APR	1.80	7.3	67	2.16	5.1	60	0	-	1260	0
MAY	2.11	5.7	68	1.97	4.3	55	0	-	1533	0
JUN	2.00	5.1	74	2.30	4.1	65	0	-	1358	0
JUL	1.58	5.9	66	2.68	5.6	60	0	-	1589	0
AUG	1.86	5.7	66	1.33	4.3	56	0	-	784	0
SEPT	2.37	5.7	56	1.67	5.0	62	0	-	1073	0
OCT	2.27	6.4	62	3.41	5.0	55	0	-	2009	0
NOV	1.64	6.0	66	.87	-	-	0	-	511	0
DEC	2.03	6.1	65	2.44	-	-	0	-	1659	0
TOTAL	23.26	-	-	25.07	-	-	0	-	15339	0
AVERAGE	1.93	-	67	2.09	-	59	0	-	1278	0

COMMENTS

The volatile solids reduction was calculated at 29%, which is 3% less than the previous year. The total solids concentration in the raw sludge of 6.2% was similar to that of 1967.

The digested sludge, however, was more concentrated in 1968, resulting in decreased haulage costs per cubic yard of liquid sludge. The total solids concentration in 1967 and 1968 were respectively 4.2% and 4.7%.

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CONCLUSIONS

The plant produced an excellent effluent with BOD and suspended solids concentrations below the OWRC objectives. The average daily flows to the plant decreased from 4.35 mgd in 1967 to 3.40 mgd due to a major processing industry suspending operations in 1968.

An expansion study was carried out by Canadian British Engineering Consultants Limited to determine the type of tertiary treatment and plant expansion requirements.

Using present design criteria, the capacity of the existing plant was determined to be six mgd rather than the previous estimate of four mgd. This latter figure was based on new conservative design parameters. Tertiary treatment was recommended, and further work to this end is being carried out.



Water management in Ontario